MICROSCOPY.

Dr. Henri Van Heurck, the well-known director of the Botanical Gardens at Antwerp, Belgium, proposes to issue a "Synopsis of the Belgian Diatoms," in a series of six numbers, each one to contain about a dozen plates. The division of plates will be such that the great groups of diatoms will be comprehended each in two parts, as follows: I and II, *Raphideæ: Amphoreæ, Cymbelleæ, Naviculeæ, Gomphonemeæ*, etc.; III and IV, *Pseudo-Raphideæ: Epithemieæ, Synedreæ, Surirelleæ, Nitzschieæ*, etc.; V and VI, *Crypto-Raphideæ: Melosireæ, Coscinodisci*, etc. This arrangement is that proposed by Prof. Hamilton L. Smith in the general synopsis of the Diatomaceæ as inserted in the "Traitè du Microscope" (3e édition Bruxelles, 1878), de Mr. le Dr. Henri Van Heurck.

The price of each plate, accompanied by its description, is 75 centimes (15 cents), to subscribers; to non-subscribers, after publication, the price will be one franc (20 cents), per plate. The numbers will appear at intervals of three to four months. The text will be published after completion of the plates. It will embrace a description of all the forms hitherto found, or likely to be found in Belgium, indicating localities, etc., and with synoptical tables for determination, etc., etc. The price of this volume is fixed at 7½ francs.

Dr. Van Heurck has sent to me a limited number of specimen plates and the prospectus of above work, which I will be pleased to send to any one taking special interest in the diatoms, and intending to subscribe.

The name of Dr. Van Heurck is a sufficient pledge that this "synopsis" will be issued strictly according to the prospectus, as announced above; and it cannot fail to be very acceptable to every student of these beautiful and wonderful microscopical plants. The "British Diatomaceæ" is now almost beyond reach, and nothing that I know of will so nearly supply its place as Dr. Van Huerck's proposed Synopsis. Besides containing probably all the species described in the "British Diatomaceæ," there will be many not included in that, and embracing by far the greater number of forms found in our own country.

It will give me pleasure to communicate any further information. Address, "Monsieur le Dr. Henri Van Heurck, Directeur du Jardin Botanique, Rue de la Santè, 8, Anvers, Belgique."

I will only add that the plates are heliographic reproductions of enlarged drawings made by Dr. Van Huerck, or by M. Grunner, and that M. Deloyne of Brussels proposes to issue a series of diatom preparations, in boxes containing twenty-five slides each, similar to those of my own "Species Typicæ," and in accordance with the synopsis of M. H. Van Heurck.

H. L. SMITH.

HOBART COLLEGE, *July* 1, 1880.

NATURAL HISTORY.

Mr. Proctor remarks that among the problems with which science has not as yet succeeded in dealing satisfactorily is that of the flight of birds, and especially the flight of those birds which float for long periods of time without any apparent movement of their wings. During my voyage from San Francisco to Honolulu (which latter place, by the way, I have not reached at the moment of writing to the *Newcastle Weekly Chronicle*, 2.20 P. M., April 17th, ship time—lat. about 26° 35′ and longitude about 145° west, so that Greenwich time is about midnight, April 17th) I have noted with much interest the flight of the birds—the sailors call them mollyhawks—which follow the ship apparently without ceasing, except for an occasional short rest on the water. It is certain that for many minutes together—in some cases I should say for fully ten minutes—these birds do not use their wings except to guide their movements and to sustain their bodies in the same sense that a parachute sustains a weight suspended to it—that is, they do not make active use of their wings, though of course a certain degree of muscular exertion must be involved in the mere sustentation of the body. I have seen nothing yet to confirm the statement I have often heard made, that these birds, albatrosses, and others, will float about, sustaining their bodies in this, as it were, passive manner during much longer periods of time, as an hour or so. I should be inclined to doubt whether a bird could be, or has been, steadily watched even for half an hour. But if they do, the problem is not altered in character, but only in degree. Now it is manifest, in the first place, that the flight of a bird is not—as some who reject all attempts at explanation, would seem to imply—a miraculous phenomenon, but one purely dependent on ordinary mechanical laws. The muscular power shown by birds may be, and indeed is, very marvellous. The perfect adjustment of all their movements to obtain the greatest possible effect from every muscular effort, might probably be shown to be equally so, if we were able to analyze each movement as made, instead of being foiled as we are by the exceeding rapidity of a bird's evolutions. And, again, it is possible that the sustaining power of the air on bodies of particular form traveling swiftly through it may be much greater or very different in character from what has been hitherto supposed. But it is quite certain that the flight of birds depends on ordinary laws, however difficult it may be to explain it by their means. It may be a step towards the solution of the problem to consider what attempted explanations must at any rate be rejected. Amongst these is one which has been often advanced, and which seems to have a singular attraction for unscientific persons—the theory, namely, that the bones and quills of a bird are filled with some light gas, floating the bird in the same way that balloons are raised by the hydrogen gas within the silk. Those who hold this theory seem to imagine that hydrogen possesses some lifting power, as though the gas of itself sought to rise upwards from the earth. In reality, of course, hydrogen obeys the law of gravity and is drawn downwards, and not upwards. It rises much as the least heavily loaded scale of a balance rises—not because its own tendency is upwards, but because something else has a stronger tendency downwards. If a balloon instead of being filled with hydrogen were absolutely empty, and could yet retain its shape against the pressure of the surrounding air, it would rise more quickly than when filled with hydrogen, for the simple reason that it would be relieved of the weight of the hydrogen itself, which, though much smaller than that of an equal volume of air, still counts for something. Similarly, if the quills and hollow bones of the bird absolutely empty—no air nor the lightest gas being present in them — the lifting power resulting from this condition of things would be the greatest possible under the circumstances. A yet greater, in fact a very much greater lifting power would result if the whole body of the bird were hollow and vacuous. But how ineffective even this lifting power would be to raise the actual weight of the bird may be seen from the following simple considerations:—The specific gravity of a bird is certainly not less than a third that of water, as may be shown at once by observing how much of a bird's body is under water when the bird is floating. We may then safely assume that a bird's specific gravity is equal to 200 times the specific gravity of air. The difference then between the weight of the air displaced by a bird's body and the no-weight at all of an equal volume absolutely void, is only 1-200th part of the actual weight of the bird's body. This is the whole effective lifting force even in the perfectly imaginary case in which the entire volume of the bird is supposed to be available for this kind of support. The remaining 199-200ths, or practically the whole weight of the body, is left unsupported in this way, and some other explanation of the observed fact that it is supported remains to be sought for. I believe the true explanation is to be found in the enormous propulsive power of a bird's wings, combined with the perfect balance which the bird is able to maintain, with such changes only as may be rendered necessary by the changing direction of his motion. Of course I am aware that gravity acts with equal efficiency on a body traveling swiftly as on a body at rest. A cannon-ball allowed to fall from the mouth of a cannon reaches the earth no more quickly than one fired horizontally from the cannon's mouth. But I believe that a flat body travelling swiftly in a horizontal direction with its plane horizontal, sinks far more slowly earthwards than one of a similar shape which is not advancing or is only advancing slowly. The difference may be compared to that which would be noted between the fall of a flat stone on the surface of water when the stone is allowed simply to drop, and when it has been propelled horizon-